The present disclosure includes that contained in the present claims as well as that of the foregoing description. Although this invention has been described in its preferred forms with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and numerous changes in the details of construction and combination and arrangement of parts and method steps may be resorted to without departing from the spirit and scope of the invention. Accordingly, the scope of the invention should be determined not by the embodiment[s] illustrated, but by the appended claims and their legal equivalents.

The invention claimed is:

1. A pre-filtration water decontamination apparatus comprising:

an oxygen saturator means for introducing high-pressure air and a high-pressure water mixture therein and to substantially saturate the high-pressure water mixture with excess oxygen thereby creating a high-pressure oxygenated mixture (HPOM) stream;

a blender for receiving and mixing said HPOM stream from said oxygen saturator means with influent water containing contaminants to be removed;

means for directing said HPOM stream from said oxygen saturator means at a pre-determined pressure to said blender, and means for directing influent water to said blender at a pressure substantially less than the pressure of said HPOM stream such that a white-water process (WWP) stream comprising a plurality of micro-bubbles is created in said blender;

a separator for receiving the WWP stream from said blender, said separator comprising means for causing upward vortex rotation of the WWP stream, for separating from said WWP stream a waste water stream along a central axis of the upward vortex of said separator, and for separating from said WWP stream a decontaminated water (DCW) stream along an outer wall of said separator; and

recovery means for directing discharge of the DCW stream out of the apparatus through a water outlet, and for directing disposition of the waste water stream.

2. The apparatus according to claim 1 wherein said high-pressure water mixture is ionized.

3. The apparatus according to claim 1 further including a pressure regulator for maintaining pressure at a predetermined level in said oxygen saturator means prior to passage of said HPOM stream to said blender.

4. The apparatus according to claim 3 wherein said pressure is maintained at between about 80 psi to about 150 psi.

5. The apparatus according to claim 3 wherein said pressure is maintained at about 120 psi.

6. The apparatus according to claim 1 further including air compressor means for supplying air at a pre-determined pressure to said oxygen saturator means.

7. The apparatus according to claim 6 wherein said pressure is maintained at between about 80 psi to about 150 psi.

8. The apparatus according to claim 6 wherein said pressure is maintained at about 120 psi.

9. The apparatus according to claim 6 further comprising a saturator inlet port, a saturator chamber, and a flow distributor.

10. The apparatus according to claim 9 further comprising means for maintaining an air envelope within said saturator chamber.

11. The apparatus according to claim 10 further comprising level sensing means for sensing a water level of said HPOM stream

within said saturator chamber and for maintaining said air envelope therein.

12. The apparatus according to claim 9 wherein said saturator chamber further comprises fill material within said saturator chamber, and a holding assembly for maintaining said fill material within said saturator chamber.

13. The apparatus according to claim 9 wherein said flow distributor comprises one or more spoke-slot sets to comprise a section, wherein each sequential spoke-slot set, of the one or more spoke-slot sets, adjacent to a previous spoke-slot set has slot therein larger than the slot of the previous spoke-slot set.

14. The apparatus according to claim 13 wherein said one or more spoke-slot sets comprises between six to twelve spoke-slot sets.

15. The apparatus according to claim 13 wherein said flow distributor comprises one or more sections of said one or more spoke-slot sets.

16. The apparatus according to claim 15 where said one or more sections comprises between about four to twelve sections.

17. The apparatus according to claim 1 wherein said means for directing said influent water to said blender comprises a suction pump adjacent to said blender.

18. The apparatus according to claim 17 wherein said pressure substantially less than the pressure maintained in said oxygen saturator is approximately zero to a negative pressure

19. The apparatus according to claim 17 wherein said blender further comprises an intake chamber in communication with said HPOM stream, a mixing chamber having a floor with a plurality of inlet slots therein in communication with said influent water, a plurality of nozzles between said intake chamber and said mixing chamber, wherein said HPOM stream enters said mixing chamber through said plurality of nozzles thereby producing a plurality of micro-bubbles and said influent water enters said mixing chamber through said plurality of inlet slots and blends with said micro-bubbles to thereby form a white-water process (WWP) stream.

20. The apparatus according to claim 19 wherein said plurality of inlet slots are located between said influent water entry and said plurality of nozzles.

21. The apparatus according to claim 19 wherein said plurality of inlet slots radiate outward from the center of said mixing chamber.

22. The apparatus according to claim 19 wherein said plurality of inlet slots are equal in number to said plurality of nozzles and are in approximate alignment thereto.

23. The apparatus according to claim 19 wherein said mixing chamber further comprises a dimpled inner wall.

24. The apparatus according to claim 1 wherein said separator comprises a vertically oriented tube having a central axis, an outer wall and upper, central and lower sections with a separator

inlet port in said lower section for receiving said WWP stream from said blender and a water outlet in said upper section for discharging said DCW stream.

25. The apparatus according to claim 24 wherein said separator inlet port is oriented at a predetermined angle so that a rotating vortex is formed for said WWP stream and said lower section comprises a sump below said separator inlet port for collecting heavy particles and a drain for periodically removing said heavy particles.

26. The apparatus according to claim 24 wherein said central section has a diameter less than that of the upper and lower sections and includes gradual transitions therebetween.

27. The apparatus according to claim 1 wherein said recovery means comprises filtration means for filtering said waste water.

28. The apparatus according to claim 27 wherein said recovery means further comprises sensing means for sensing the level of waste water accumulating adjacent to said water outlet.

29. The apparatus according to claim 28 wherein said recovery means further comprises waste disposition means for directing the flow of filtered waste water to said blender.

30. The apparatus according to claim 29 wherein said waste disposition means further comprises means for capturing recyclable waste and discharging it for recycling.

31. The apparatus according to claim 30 wherein said waste disposition means further comprises means for cleaning said

filtration means of non-discharged recyclable waste and directing it to said blender.

32. The apparatus according to claim 28 further comprising a gas relief valve for releasing gases.

33. The apparatus according to claim 28 further comprising a gas filtering means for filtering toxic gases.

34. An oxygen saturator for use in a pre-filtration water decontamination system comprising:

means for introducing high-pressure air and a high-pressure water mixture therein and to substantially saturate the high-pressure water mixture with excess oxygen thereby creating a high-pressure oxygenated mixture (HPOM) stream;

means for directing said HPOM stream from said oxygen saturator at a pre-determined pressure; and

air compressor means for supplying air at a pre-determined pressure to said oxygen saturator.

35. The oxygen saturator according to claim 34 wherein said pressure is maintained at between about 80 psi to about 150 psi.

36. The oxygen saturator according to claim 34 wherein said pressure is maintained at about 120 psi.

37. The oxygen saturator according to claim 34 further comprising a saturator inlet port, a saturator chamber, and a flow distributor.

38. The oxygen saturator according to claim 37 further comprising means for maintaining an air envelope within said saturator chamber.

39. The oxygen saturator according to claim 38 further comprising level sensing means for sensing a water level of said HPOM stream within said saturator chamber and for maintaining said air envelope therein.

40. The oxygen saturator according to claim 37 wherein said saturator chamber further comprises fill material within said saturator chamber, and a holding assembly for maintaining said fill material within said saturator chamber.

41. The oxygen saturator according to claim 37 wherein said flow distributor comprises one or more spoke-slot sets to comprise a section, wherein each sequential spoke-slot set, of the one or more spoke-slot sets, adjacent to a previous spoke-slot set has slot therein larger than the slot of the previous spoke-slot set.

42. The apparatus according to claim 41 wherein said one or more spoke-slot sets comprises between six to twelve spoke-slot sets.

43. The apparatus according to claim 41 wherein said flow distributor comprises one or more sections of said one or more spoke-slot sets.

44. The apparatus according to claim 43 where said one or more sections comprises between about four to twelve sections.

45. A blender for use in a pre-filtration water decontamination system comprising:

means for receiving and mixing a high-pressure oxygenated mixture (HPOM) stream;

means for receiving influent water at a pressure substantially less than the pressure of said HPOM stream;

an intake chamber in communication with said HPOM stream;

a mixing chamber having a floor with a plurality of inlet slots therein in communication with said influent water;

a plurality of nozzles between said intake chamber and said mixing chamber, wherein said HPOM stream enters said mixing chamber through said plurality of nozzles to thereby produce a plurality of micro-bubbles and said influent water enters said mixing chamber through said plurality of inlet slots to thereby blend with said micro-bubbles to create a white-water process (WWP) stream thereby.

46. The blender according to claim 45 wherein said means for receiving influent water at a pressure substantially less than the pressure of said HPOM stream comprises a suction pump adjacent to said blender.

47. The blender according to claim 46 wherein said pressure substantially less than the pressure of said HPOM stream is approximately zero to a negative pressure.

48. The blender according to claim 45 wherein said plurality of inlet slots are located between said influent water entry and said plurality of nozzles.

49. The blender according to claim 45 wherein said plurality of inlet slots radiate outward from the center of said mixing chamber.

50. The blender according to claim 45 wherein said plurality of inlet slots are equal in number to said plurality of nozzles and are in approximate alignment thereto.

51. The blender according to claim 45 wherein said mixing chamber further comprises a dimpled inner wall.

52. A separator for use in a pre-filtration water decontamination system comprising:

means for receiving a process stream and causing upward vortex rotation of the process stream;

means for separating from said process stream a waste water stream along a central axis of the upward vortex of said separator, and for separating from said process stream a decontaminated water (DCW) stream along an outer wall of said separator; and

recovery means for directing discharge of the DCW stream out of the separator through a water outlet, and for directing disposition of the waste water stream.

53. The separator according to claim 52 wherein said separator is a vertically oriented tube having an outer wall, an upper section with said water outlet in said upper section, a central section, and a lower section with a separator inlet port in said lower section for receiving said process stream.

54. The separator according to claim 53 wherein said separator inlet port is tangentially-oriented so that a rotating vortex is formed for said process stream and said lower section comprises a sump below said separator inlet port for collecting heavy particles and a drain for periodically removing said heavy particles.

55. The separator according to claim 53 wherein said central section has a diameter less than that of the upper and lower sections and includes gradual transitions therebetween.

56. The separator according to claim 52 wherein said recovery means comprises filtration means for filtering said waste water.

57. The separator according to claim 56 wherein said recovery means further comprises waste sensing means for sensing the level of waste water accumulating adjacent to said water outlet.

58. The separator according to claim 57 wherein said recovery means further comprises waste disposition means for directing the flow of filtered waste water out of said recovery means.

59. The separator according to claim 58 wherein said waste disposition means further comprises means for capturing recyclable waste and discharging it out of said recovery means for recycling.

60. The separator according to claim 59 wherein said waste disposition means further comprises means for cleaning said filtration means of non-discharged recyclable waste and directing it out of said recovery means.

61. The separator according to claim 57 further comprising a gas relief valve therein for releasing gases.

62. The separator according to claim 52 wherein said separator is a structure comprising a tubular column having a central region narrower than end regions, an approximately cylindrical upper section with said water outlet thereat, and an approximately cylindrical top section having a waste outlet for said waste water stream.

63. A method of removing contaminants from influent water which comprises the steps of:

directing oxygenated ozone-treated water into an air saturator;

directing air at a pressure of between about 80 psi to about 150 psi into said air saturator to saturate said oxygenated ozone-treated water thereby creating a high-pressure oxygenated water mixture;

directing said high-pressure oxygenated ozone-treated water mixture to a blender;

at a pressure substantially lower than the pressure of said high-pressure oxygenated ozone-treated water mixture, directing influent water containing at least some contaminants to said blender;

mixing said high-pressure oxygenated ozone-treated water mixture and said influent water thereby creating a plurality of

micro-bubbles and entraining particles in a resulting white-water mixture;

directing said white-water mixture to a separator;

causing said white-water mixture to rotate about an axis in said separator so that waste water, with entrained contaminants, is separated from said white-water mixture by coalescing along said axis, and decontaminated water separated from said white-water mixture away from said axis and from said waste water;

removing said waste water; and

removing said decontaminated water.

64. The method according to claim 63 wherein said mixing is increased by causing turbulent flow over dimples in walls of said blender.

65. The method according to claim 63 further including regulating pressure of water passing from said air saturator to said blender at a predetermined level at between about 80 psi to about 150 psi.

66. The method according to claim 65 wherein said pressure is regulated to approximately 120 psi.

67. The method according to claim 63 further comprises collecting heavy particles at a lower end of said separator.

68. The method according to claim 63 further comprises removing air bubbles and buoyant particles from a predetermined location at about an upper end of said separator.

69. The method according to claim 68 further comprises removing air and any gases present from an upper end of said separator above said predetermined location.

70. The method according to claim 69 further comprises filtering toxins from said any gases present.

71. The method according to claim 63 further comprises filtering and reclaiming said waste water for additional treatment.

72. The method according to claim 71 further comprises returning filtered waste water to said blender.

73. The method according to claim 71 further comprises capturing recyclable waste in a filter and removing said recyclable waste for recycling.

74. The method according to claim 73 further comprises cleaning said filter and directing its resultant product to said blender.